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19 MAR 1970

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MEMORANDUM FOR: Assistant Deputy Director for Intelligence

SUBJECT : Request for Approval of Change-in-Scope Amounting to  
[redacted] from FY-1970 R&D Funds for Contract [redacted]  
with the [redacted]

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1. This memorandum requests approval for the commitment of funds for a change-in-scope of Contract [redacted]. The specific request is stated in Paragraph 6.

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2. NPIC currently has a fixed price contract with [redacted] to fabricate a High Precision Stereocomparator at a cost of [redacted]. This is an extremely sophisticated instrument which provides ultrahigh precision measurements over dual, large format stages. One of the instrument's many state-of-the-art advances is automatic stereocorrelation; i.e., stereo images of differing geometry are automatically brought into visual fusion as the operator moves from one portion of the imagery format to another. This feature is extremely important in obtaining ultra-accurate vertical and horizontal measurements from stereo photography. Because of this and other equally sophisticated features, the Stereocomparator contains an integral digital computer [redacted] (DDP 516) which controls the internal mechanical, optical, and electronic functions of the Comparator. The 516 computer is utilized somewhat analogous to an automatic pilot in an aircraft; i.e., it controls its operations.

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Under our contract, [redacted] agreed to provide a 516 computer with a 16,000-word memory which, at that time, was considered more than adequate to handle the Comparator's intended operations. Although there originally was some excess capacity in the core memory, the basic programming proved to be significantly more complicated than anticipated, and the excess capacity was soon expanded. [redacted] overall programming effort is nearing completion, and it is now apparent that the core capacity is saturated. In order to extend the usefulness of the 16K core, [redacted] worked out a series of auxiliary programs and subroutines which could be inputted to the computer by punched paper tape. However, this procedure has serious operational drawbacks, since it calls for a lengthy reloading of data for each different acquisition system involved plus an additional data reloading for each stereo pair of imagery utilized. Even though this is a working system and fulfills the terms of the con-

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Excluded from automatic  
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SUBJECT: Request for Approval of Change-in-Scope Amounting to [REDACTED]  
From FY-1970 R&D Funds for Contract [REDACTED]

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tract, a recent operational review by IEG/PHD, PSG/AID, and TSSG/RED revealed that the procedure appears too cumbersome and highly wasteful of man-hours by IEG/PHD personnel. It would appear both more efficient and more cost effective to expand the memory and store these subroutines internally making them continually and instantly available, thereby saving both manpower and machine time. Other factors tend to support the logic of increasing the memory capacity of the DDP 516 at this time:

a. It will provide adequate memory to hold the entire program at one time and omit the loading of various subroutines to handle individual mensuration problems. It will also provide the programmer with sufficient memory to expand or improve existing programs.

b. When the contract was negotiated with [REDACTED] only the [REDACTED] [REDACTED] were in existence or in the planning stage. With the development of the [REDACTED] IEG/PHD, with the support of PSG/AID and TSSG/APSD, will program the 516 computer to handle the imagery from the [REDACTED]. The extra memory will enable them to take care of the new system plus having the ability to handle any extra requirements.

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c. Since the Stereocomparator System is very complicated, it is intended to contract in the near future for a diagnostic routine program. This program will be loaded into the 516 computer to make the various mechanical, optical, and electrical subsystems perform certain tests to determine trouble points in case of instrument failure or maintenance problems. The extra memory will allow this diagnostic routine to be entered into the computer without affecting the existing program.

d. There is no additional capacity for future expansion of the comparator's capabilities. The internal programs required for future acquisition systems may be considerably more complicated than present programs, thereby requiring additional memory capacity. It will be considerably more expensive to add the required capacity at a later date--wiring and interface costs will be at their minimum during initial fabrication. Furthermore, a later change to the memory core would require shutting down of the comparator until the interface wiring could be completed and the system debugged. This operational down time is highly undesirable.

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SUBJECT: Request for Approval of Change-in-Scope Amounting to [redacted]  
from FY-1970 R&D Funds for Contract [redacted] with the [redacted]  
[redacted]

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e. In summary, the originally planned computer memory capacity has been outstripped by changing requirements and additional demands. It is to NPIC's overall advantage to obtain additional memory capacity now, for present as well as for future operations of the High Precision Stereocomparator.

3. R&D has reviewed the best methods of incorporating this additional memory capacity; there are two basic approaches, core storage and drum storage. Generally speaking, core storage is more expensive but much more flexible than drum storage. Drum and core storage components for the [redacted] 516 computer come in 8,000-word increments with a 32,000-word core maximum limitation. [redacted] has submitted a proposal with four options. Two options are for drum storage, one for 8,000 words and one for 16,000 words. Two options are for core storage, also for 8,000- and for 16,000-word additions. Mechanical drum storage is considered to be subject to wear and breakdown, in which event the entire drum memory would be useless. Drum storage also requires more sophisticated programming because it is less versatile. Conversely, core storage is solid state, easier to program, requires little or no maintenance, and the loss of a few solid state core positions can be readily overcome by rerouting or bypassing. From a performance and operational point of view, core storage is much preferred over mechanical drum storage.

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Present operational requirements call for a minimum of 22,000-word computer storage capacity. If an 8,000-word core were added to the present 16,000-word capacity of the [redacted] 516, only 2,000 additional words of memory would be available for adding any unanticipated parameters of the [redacted]—no margin for error. However, the addition of a 16,000-core memory will provide sufficient space for all of the [redacted] system requirements and, in addition, will allow space for the more complex parameters of future systems. The proposed modification is state-of-the-art, involving standard procedures with a minimum of special wiring involved. There is little or no significant technical risk involved.

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4. As the prime contractor on the High Precision Stereocomparator, [redacted] would be the logical one to acquire and install the additional [redacted] memory core and to arrange for the necessary software changes. [redacted] is the only contractor that can perform the above operations in time to meet the scheduled delivery date for the completed comparator.

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from FY-1970 R&D Funds for Contract [redacted] with the [redacted]  
[redacted]

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6. It is requested that approval be granted for a change-in-scope to Contract [redacted] in an amount not to exceed [redacted] and to be charged against FY-1970 R&D Funds.

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ARTHUR C. LINDAHL

Director

National Photographic Interpretation Center

Attachments: (2)

1. [redacted] Proposal
2. Form 2420

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APPROVED:

Assistant Deputy Director for Intelligence

Date

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NPIC/TSSG/RED/SDB [redacted] (5 March 1970)

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